



US Army Corps of Engineers



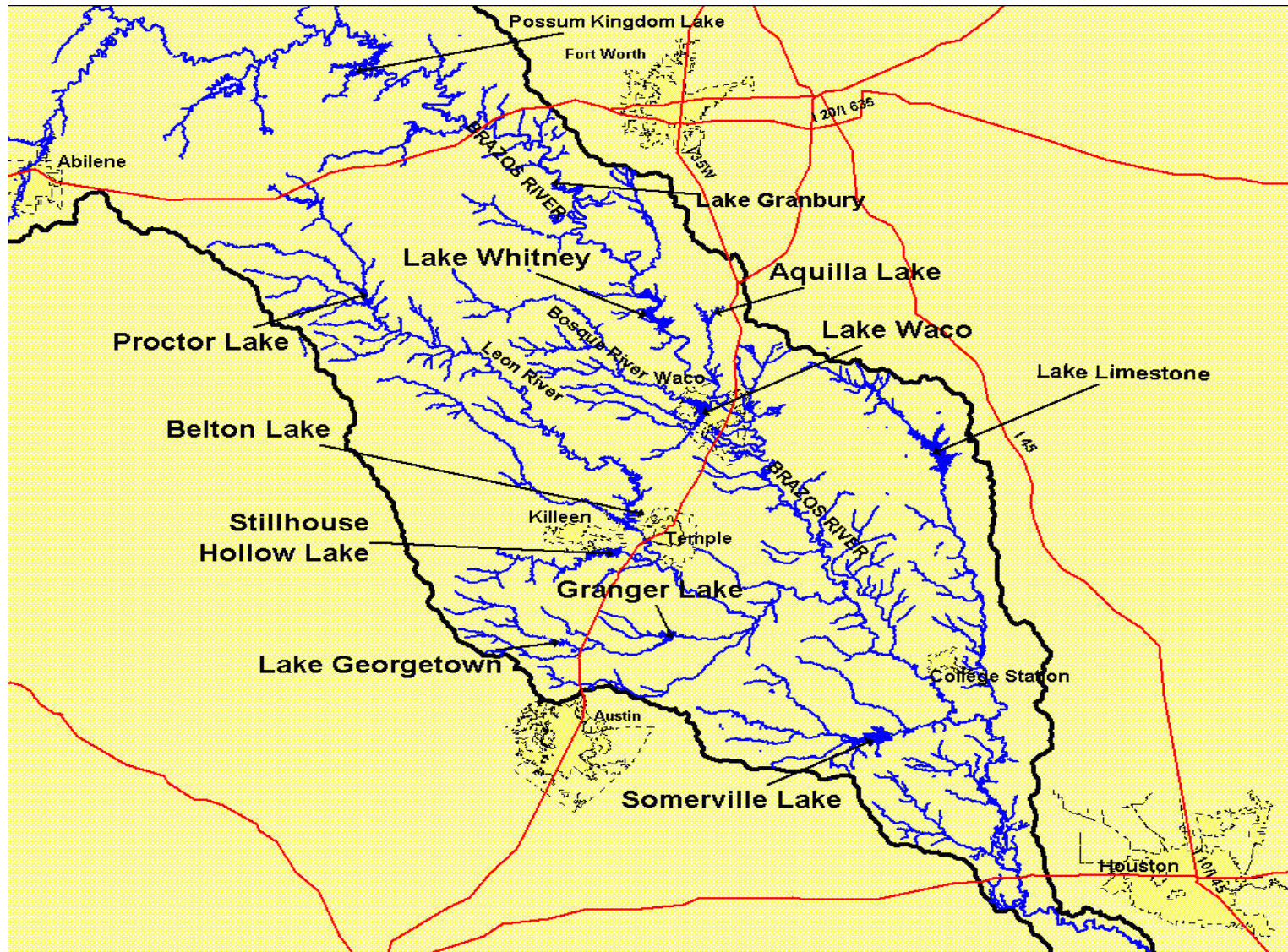
Corps of Engineers- Brazos River System



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Brazos Basin Reservoirs



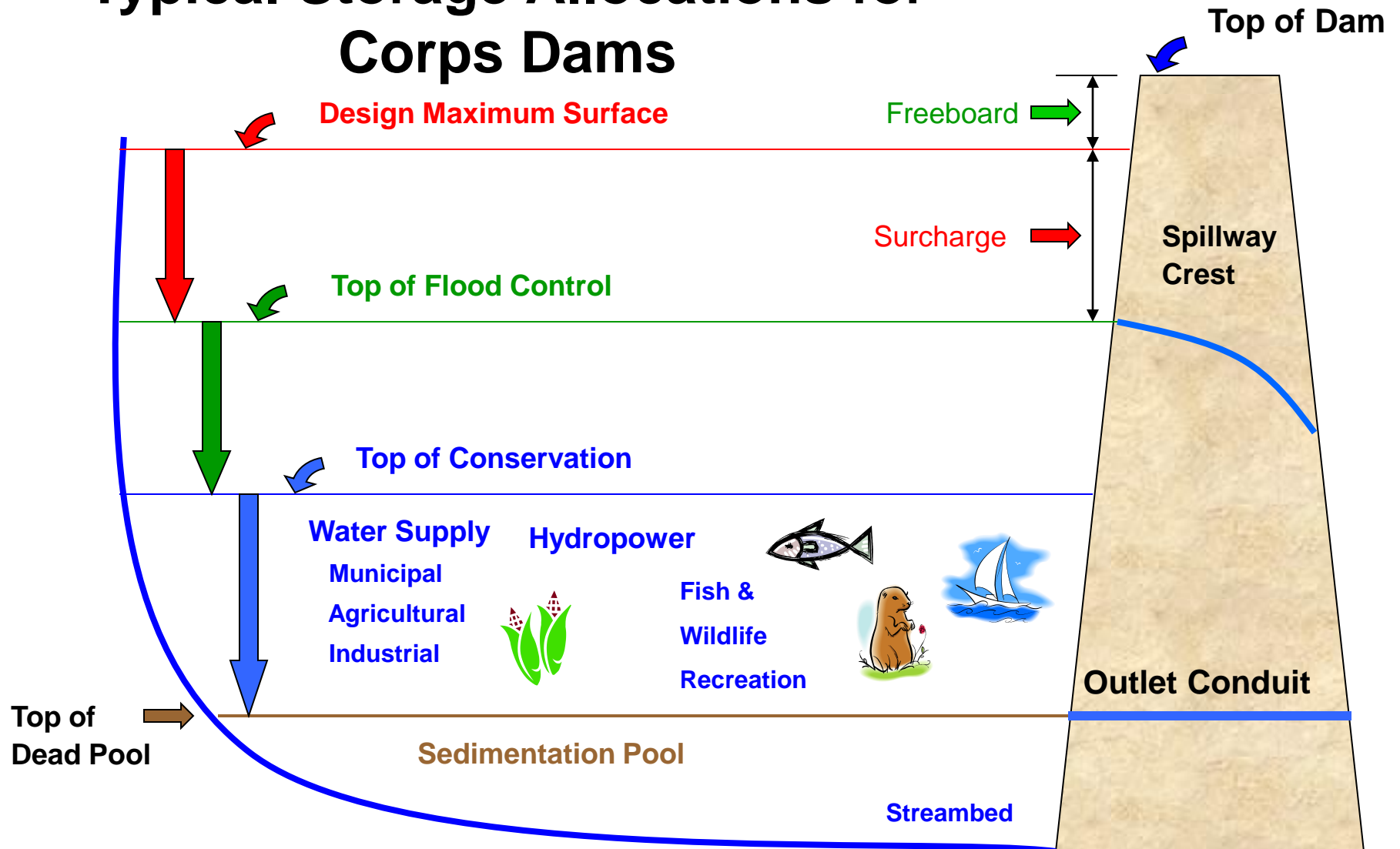


USACE Role

- Flood control for Brazos River System
- Water supply contracts at all 9 Corps projects within the Brazos River System
- Reallocations, studies, impact analysis
- Water accounting
- Day to day release scheduling
- Permitting intake structures and pipelines
- Cooperative stream gaging program



Typical Storage Allocations for Corps Dams





Maintaining Perspective On Water Management

- Historical Disasters
 - S. Fork Dam, Pennsylvania (Operational Issues)
 - May 1889, 2209 dead, \$17 mil damages
 - St Francis Dam, California (Operational & Design)
 - March 1928, 450 dead, several towns destroyed
 - Buffalo Gap, Virginia Tailings Dams (Operational & Des.)
 - Feb 72, 125 dead (COE Involvement)
 - Banqiao & Shimantan Dams (Ru & Hong Rivers, China)(Design Issues)
 - August 75, 85k dead, 11 mil affected
 - Teton Dam, Idaho (Design Issues)
 - June 1976, 11 dead, \$.5 billion damages



Flood Control Operations

- Close gates and store flood producing runoff to protect downstream areas
- Use decision support tools (data & forecasts)
- Project safety, monitoring
- Prevent uncontrolled spillway flows when possible
- Forecasts to affected parties (internal, NWS, River Authorities, etc.)
- Wait until runoff from uncontrolled areas has diminished
- Evacuate flood water as quickly as possible to prepare for subsequent flooding events



Flood Damages Prevented in Brazos Basin

Annual Flood Damages Prevented Through FY 2010
Current Dollars (Not Adjusted For Inflation)

PROJECT	FY 2010 DAMAGES PREVENTED	CUMULATIVE BENEFITS THROUGH FY 2010
Aquilla	\$ 2,978,559	\$ 38,355,059
Belton	\$ 23,096,184	\$ 245,949,284
Georgetown	\$ 1,981,834	\$ 11,169,534
Granger	\$ 6,710,073	\$ 54,486,273
Proctor	\$ 175,849	\$ 44,231,849
Somerville	\$ 1,452,665	\$ 97,609,865
Stillhouse	\$ 15,001,825	\$ 106,438,925
Waco	\$ 2,162,013	\$ 177,785,113
Whitney	\$ 4,489,714	\$ 308,715,514
Basin Total	\$ 58,048,717	\$ 1,084,741,417

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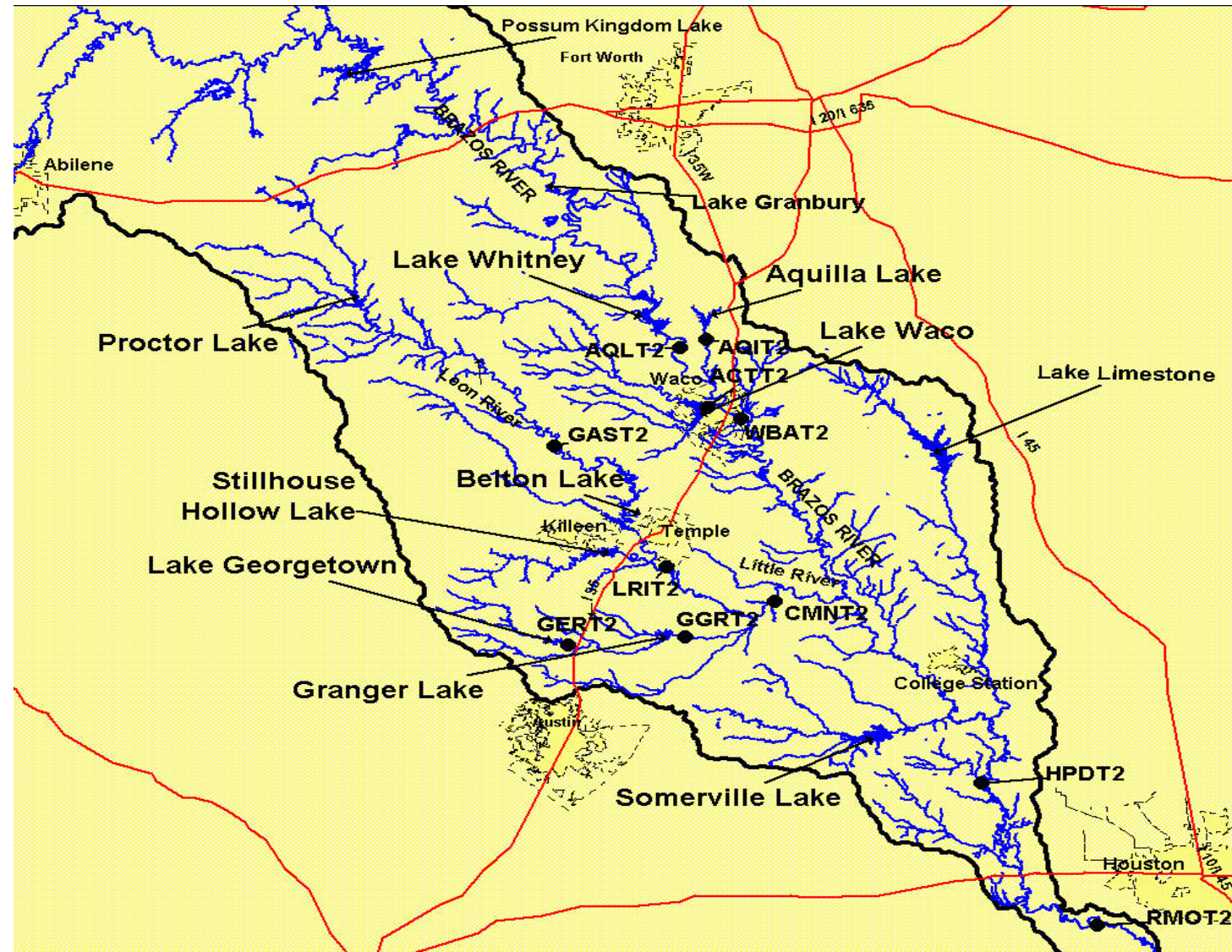


Control Points

Control points are select locations along a river, which are considered representative, for the purpose of evaluating the impact of a flood along that portion of the river. These locations are designated in the plan of regulation as regulatory discharge points.



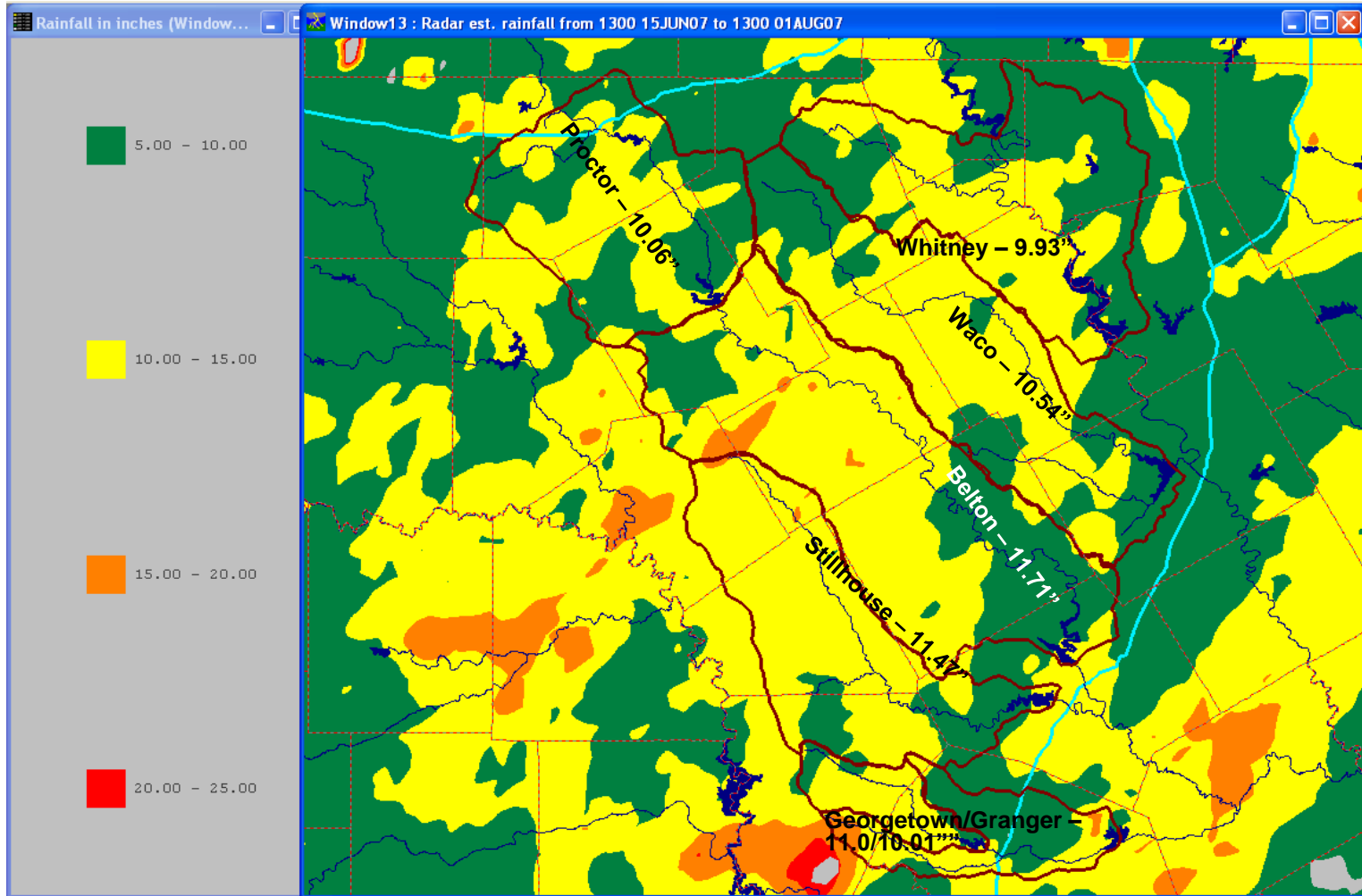
Brazos Basin Control Points



Gage	Flow (cfs)
Aquilla Creek	3,000
Gatesville on Leon Creek	5,000
Georgetown on N. Fk San Gabriel	6,000
Lane Port on San Gabriel	6,000
Little River on Little River	10,000
Cameron on Little River	10,000
Aquilla on Brazos River	25,000
Waco on Brazos River	60,000
Hempstead on Brazos River	60,000
Richmond on Brazos River	60,000



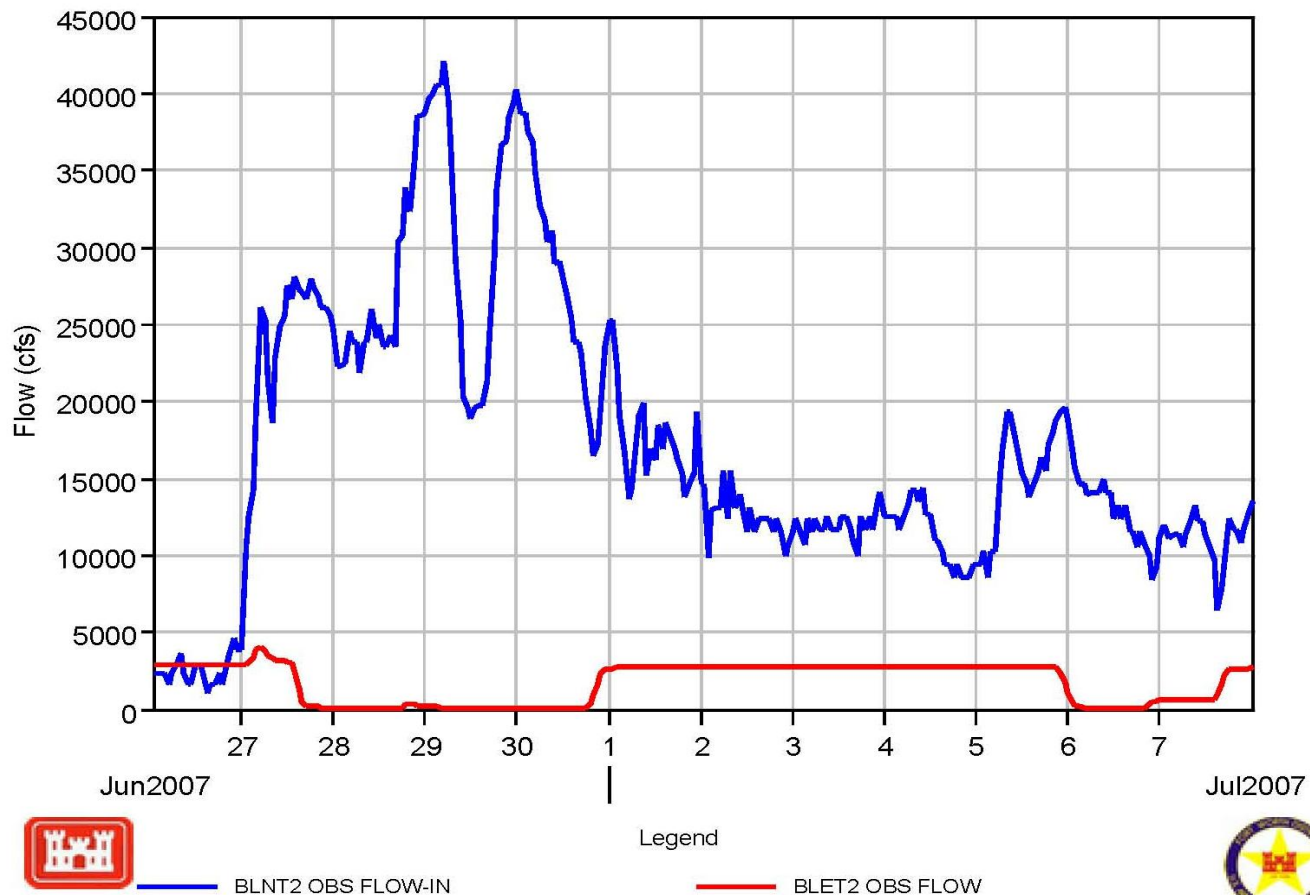
2007 Brazos Flooding (15 June – 1 August)



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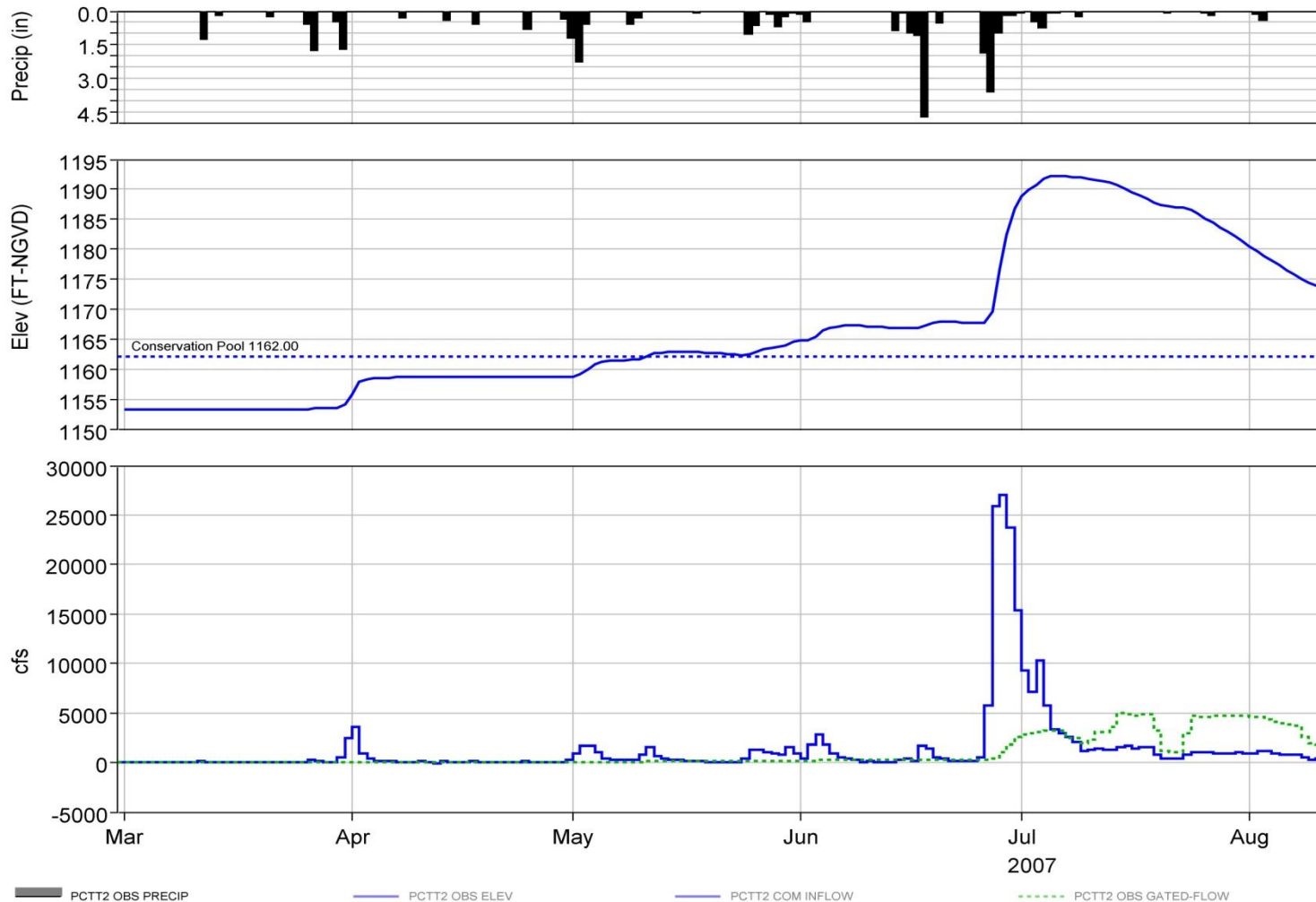
Belton Flood Hydrograph with and without Project



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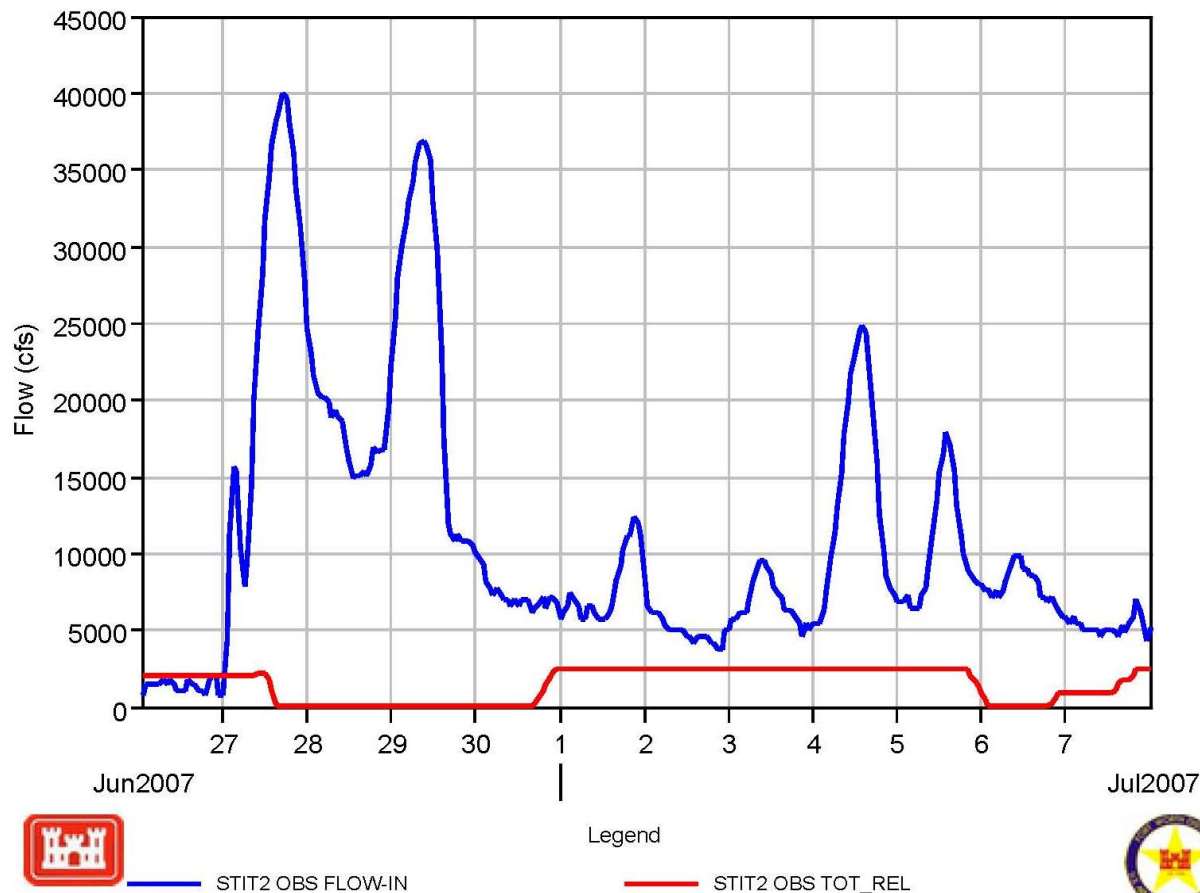
Lake Proctor



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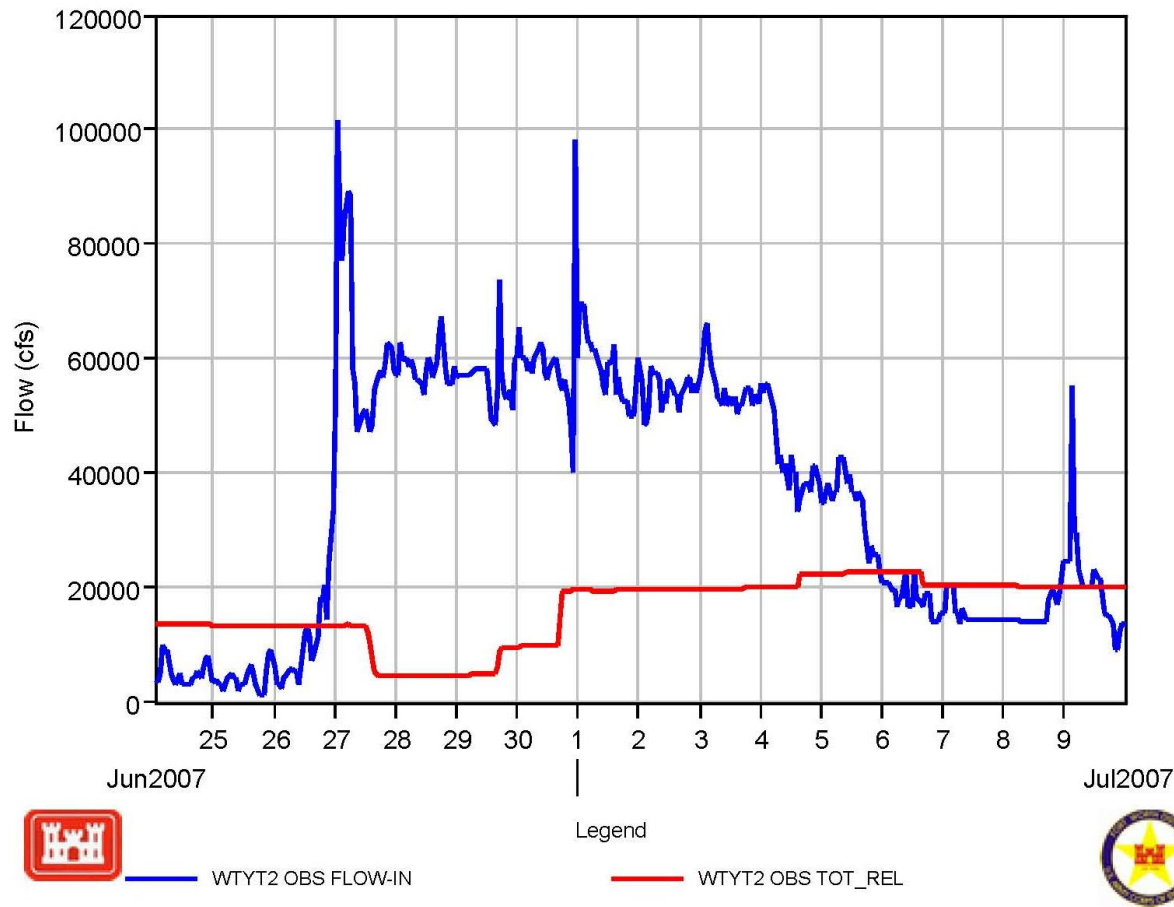


Stillhouse Flood Hydrograph with and without Project





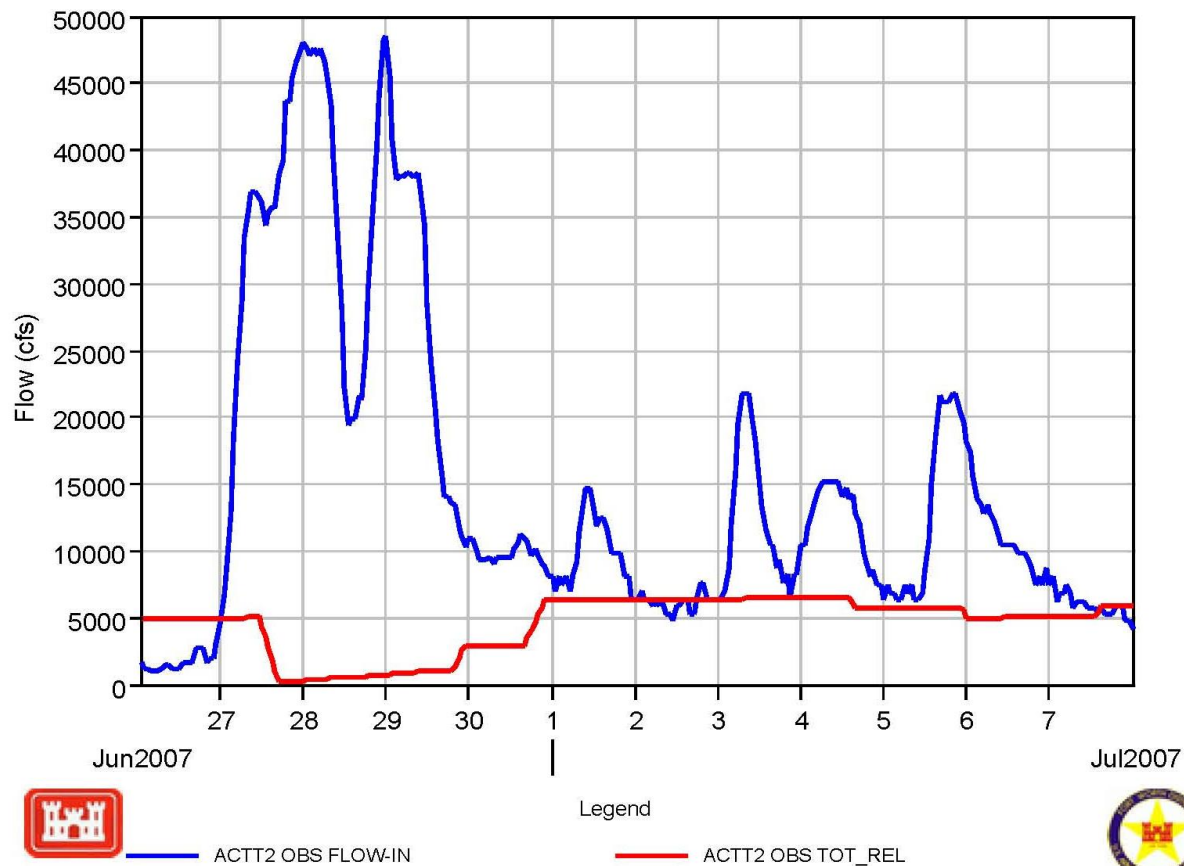
Whitney Flood Hydrograph with and without Project



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Waco Flood Hydrograph with and without Project



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Reservoir Use Information

RESERVOIR NAME	FLOOD POOL STORAGE (1000 - AC-FT)	CONSERVATION & WATER SUPPLY STORAGE (1000 - AC-FT) ¹	WATER SUPPLY CUSTOMER	NUMBER OF PARKS	AVERAGE ANNUAL HYDROPOWER GENERATION (MWH/YR) (FY10)
AQUILLA	86	34	BRA	6	N/A
BELTON	640	373	BRA	18 ³	N/A
GEORGETOWN	88	29	BRA	5	N/A
GRANGER	162	38	BRA	6	N/A
PROCTOR	310	31	BRA	4	N/A
SOMERVILLE	338	144	BRA	9 ³	N/A
STILLHOUSE HOLLOW	391	205	BRA	7	N/A
WACO	554	104	BRA & WACO	9 ³	N/A
WHITNEY	1,372	627 ²	BRA	22 ³	85,800
TOTALS	3,941	1,585		86 ³	85,800

1. Represents current and future water supply allocations.
2. Whitney has 50,000 AC-FT allocated for water supply.
3. Represents both US Army Corps of Engineers parks and parks operated by others. 65 parks are operated by the US Army Corps of Engineers.



Challenges

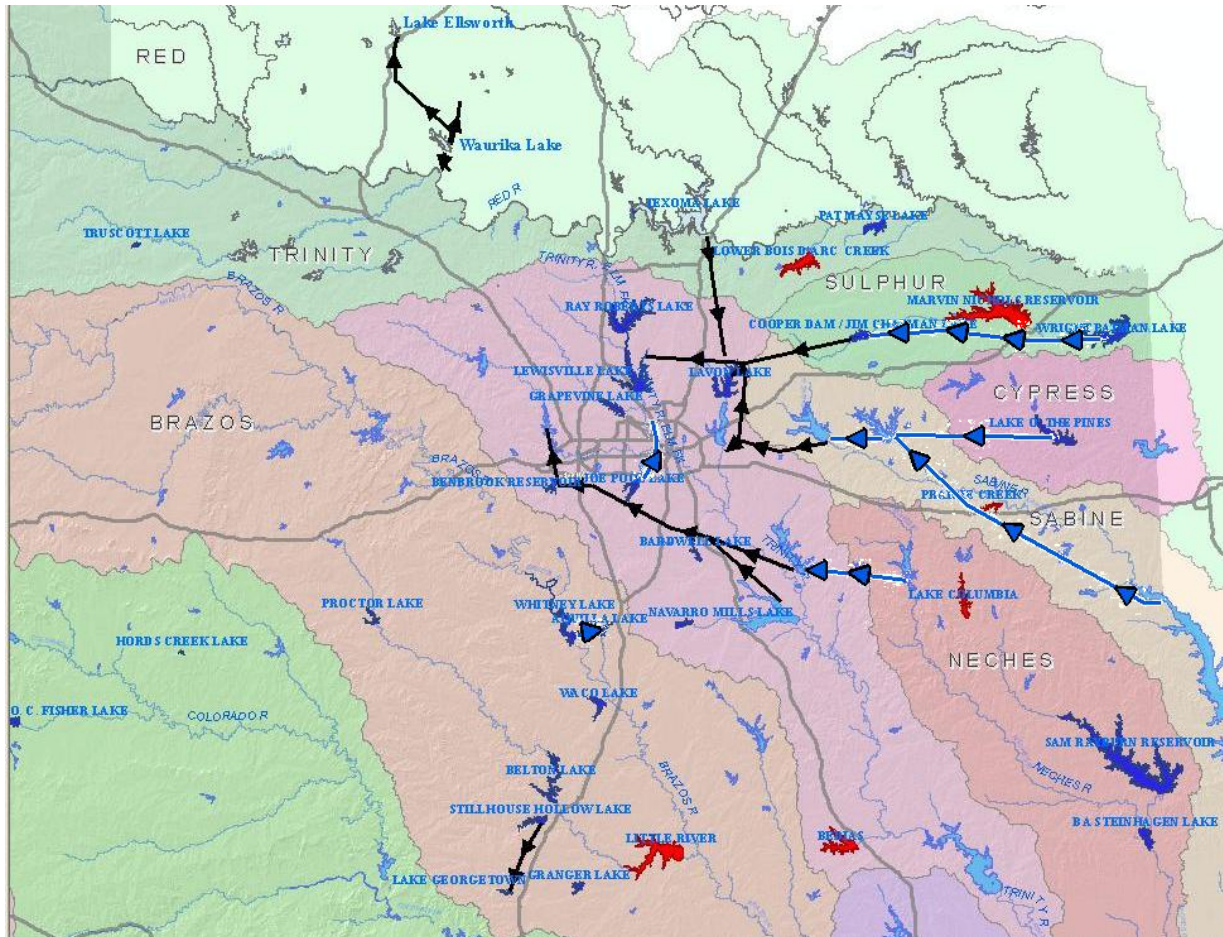
- Dam Safety Ratings
- Conflicting goals and interests
- Invasive species in pipelines
 - Golden Algae
- Terminal storage, loss of recreation benefits
- Outlet works modifications
- Climate change

Current Water Supply Studies

- Aquilla reallocation – current



Pipelines



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USACE System Simulation Modeling

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Reservoir System Simulations

- Daily Period of Record Model (RiverWare) 1939-2009
- Evaluate deviations and proposed changes to the plan of regulation
 - Flooding issues
 - Recreation interests
 - Users with conflicting needs
 - Environmental concerns
- Evaluate reallocation of flood or hydropower storage
- Perform risk assessments & evaluate what-if scenarios (flooding & drought)
- Water accounting
- Basin wide studies



Brazos River Basin



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Erosion Control in Brazos Basin



- Corps will implement tapered release system after flood events to minimize erosion within the Brazos system, most notably along the Little River and Leon River.



Deviations

- Any time reservoir water operations will be modified from normal operations, involves SWD and coordination w/ stakeholders
- Brazos Project Deviations in FY 10
 - Belton - gate repair/liner repair/rip rap
 - Georgetown – accommodate drawdown at Granger
 - Granger - rip rap/gate painting
 - Stillhouse - DSAC
 - Whitney – gate painting
 - Waco - drowning



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Questions?

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